BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images may include (but are not limited to):

- BLACK BORDERS
- TEXT CUT OFF AT TOP, BOTTOM OR SIDES
- FADED TEXT
- ILLEGIBLE TEXT
- SKEWED/SLANTED IMAGES
- COLORED PHOTOS
- BLACK OR VERY BLACK AND WHITE DARK PHOTOS
- GRAY SCALE DOCUMENTS

IMAGES ARE BEST AVAILABLE COPY.

As rescanning documents *will not* correct images, please do not report the images to the Image Problem Mailbox.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/504,623	02/15/2000	Kazuhito Tsukagoshi	2369/25	8134

23838 7590 09/03/2003

KENYON & KENYON
1500 K STREET, N.W., SUITE 700
WASHINGTON, DC 20005

EXAMINER
DOLAN, JENNIFER M

ART UNIT	PAPER NUMBER
2813	

DATE MAILED: 09/03/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/504,623	TSUKAGOSHI ET AL.	
	Examiner	Art Unit	
	Jennifer M. Dolan	2813	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *18 April 2003* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-7,13-23 and 25* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *1-7 and 18-23* is/are allowed.

6)☒ Claim(s) *13-15 and 25* is/are rejected.

7)☒ Claim(s) *16 and 17* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. Claims 13, 14, and 25 are rejected under 35 U.S.C. 102(b) as being anticipated by the IEEE Transactions on Magnetics article to Schwarzacher et al.

Regarding claim 13, Schwarzacher discloses a magnetoelectric device (page 3133, column 1, paragraph 1; column 2, paragraph 3; figure 14) responsive to an applied magnetic field (figure 15), comprising first (bottommost Co layer in figure 14) and second (topmost Co layer in figure 14) ferromagnetic regions with a channel region (Cu layers) between them wherein the channel region includes a nanotube (page 3133, paragraph 3; figure 14).

Regarding claim 14, Schwarzacher discloses a bundle of nanotubes (figure 14).

Regarding claim 25, Schwarzacher discloses a magnetic reading head for reading data from magnetic storage media (page 3133, paragraphs 1 and 2).

3. Claim 13 is rejected under 35 U.S.C. 102(e) as being anticipated by U.S. Patent Publication No. 2001/0028872 to Iwasaki et al.

Regarding claim 13, Iwasaki discloses a magnetoelectric device responsive to an applied magnetic field (paragraph 0090, 0142, 0143, 1044, 0145), comprising first and second ferromagnetic regions (Co 'layers') with a channel region (Cu 'layer' between; see figure 14), wherein the channel region includes a nanotube (a lengthwise portion of a nanotube is still a nanotube; also see paragraph 0055).

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Schwarzacher et al. in view of Journal of Experimental and Theoretical Physics article by Tsebro et al. (cited by applicant).

Regarding claim 15, Schwarzacher fails to disclose a nanotube made of carbon.

Tsebro discloses a carbon nanotube (column 1, lines 1-2).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the device of Schwarzacher to include a carbon nanotube, as taught by

Tsebro. The rationale is as follows: One of ordinary skill in the art at the time the invention was made would have been motivated to specify that the nanotubes are made of carbon, as taught by Tsebro, because carbon nanotubes provide conductivity and transport characteristics suitable for channel materials (Tsebro, column 2, lines 1-3 and column 3, lines 36-38).

Allowable Subject Matter

6. Claims 1-7 and 18-23 are allowed.

7. Claims 16 and 17 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

8. The following is a statement of reasons for the indication of allowable subject matter: The primary reason for allowance of claim 1 is that the nanotubes in the prior art of record have relatively large diameters, on the order of 30-40 nm. Such a large diameter nanotube does not provide a quasi-one-dimensional channel that is capable of maintaining the spin polarization of charge carriers, as the Applicant has argued, and there is no motivation in the prior art for decreasing the diameter of the nanotubes used in prior art magnetoresistive sensors. With respect to claims 16 and 17, although the prior art teaches the existence of silicon and boron nitride nanotubes (see U.S. Patent No. 6,265,466 to Glatkowski et al.), there is no suggestion that silicon or boron nitride nanotubes have compatible sizes and material properties, such that they could be interchanged with the channel region nanotube layers in the magnetoresistive multilayer films in the prior art.

Response to Arguments

9. The Applicant's arguments, see the Response, filed 4/18/03, with respect to claim 1 and all dependent claims have been fully considered and are persuasive. The rejections of claim 1 and all claims dependent on claim 1 have been withdrawn.

Insofar as the Applicant's arguments can be applied to claim 13, the arguments have been fully considered, but are not persuasive. The applicant argues that "the average diameter of a single walled nanotube is on the order of 1.2 to 1.4 nm, in contrast to the 40 nm diameter wire of Schwarzacher," and that "nanotube is a well known term of art." This is not persuasive, because the attached references only teach average values for "Single Wall Carbon Nanotubes", and thus, the listed diameter is only the average value for SWNT's, as opposed to a generalized definition for nanotubes. U.S. Patent No. 5,916,642 to Chang suggests that carbon nanotubes range in diameter from 1-500 nm, with a typical diameter of 5-30 nm (see column 2, lines 58-67). U.S. Patent No. 6,129,901 to Moskovits et al. teaches that nanotubes have a diameter ranging from 5-500 nm (column 2, lines 12-22). U.S. Patent No. 5,814,290 to Niu et al. discloses nanotubes having a diameter of 3.5 –70 nm (see the abstract). These references suggest that a 'nanotube' (as opposed to a SWNT), simply needs to have a diameter on the nanometer scale, and that the term 'nanotube' is not at all understood in the art as to be limited to a diameter of about 1.2-1.4 nm.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jennifer M. Dolan whose telephone number is (703) 305-3233. The examiner can normally be reached on Monday-Friday 8:30am-5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl W. Whitehead, Jr. can be reached on (703) 305-4940. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9318 for regular communications and (703) 872-9319 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

Jennifer M. Dolan
Examiner
Art Unit 2813

jmd
August 22, 2003

CARL WHITEHEAD, JR.
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800